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ABSTRACT

A replication of Peter Blau's theory of differentiation was carried out in a sample of 100 school districts. Blau has demonstrated that as organizations increase in size, the levels of hierarchy and the number of horizontal components increase at a decelerating rate with the result that large organizations have proportionately fewer administrators than do smaller organizations. Hypotheses were tested explicating such aspects of the theory as the relationships between increasing size and horizontal and vertical differentiation, administrative ratio, and relative size of components. It was found that, in the main, Blau's theory substantially explains the occurrence of increased subunits, increased coordinators, and proportional decreases in the administrative ratio as a consequence of increased size. (Author/MLF)

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A TEST OF SIZE AND DIFFERENTIATION

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Two young girls were discussing the size of dogs. One asked: "Can a dog be as large as an elephant?" Her friend responded: "No, if it were as big as an elephant, it would look like an elephant."

Gould, 1977:178

Size is an alluring variable with which to explain differences in organizations. Peter Blau, both independently and with Richard Schoenherr, has produced some of the most interesting work in this direction (Blau and Schoenherr, 1971). Blau has advanced a theory that uses size as an independent variable to explain such organizational properties as differentiation, administrative ratio, and specialization. Blau has demonstrated that as organizations increase in size, the levels of hierarchy and the number of horizontal components increase, though at a decelerating rate. As structural differentiation increases, the ratio of administrative personnel begins to rise, but this is an indirect effect of size. The direct and stronger effect of size is to lower the proportion of administrators to employees. Thus, as if to confound the popular wisdom, Blau has demonstrated that larger organizations have proportionately fewer administrators than do smaller organizations.

From the standpoint of research in schools, replications of Blau's work seem especially useful. First, such investigations allow for the translation of social science theory and explanatory frameworks into the most pervasive of social institutions, the school. There is a vast supply of data describing educational institutions, but not much data that is immediately useful. One of the signal benefits of testing a broad theory is that the theory will organize a large amount of inchoate data. Thus this study should help educational researchers. Second, school districts offer a good area for testing Blau's theory on differentiation, specialization, and administrative ratio,

even if these must be operationalized somewhat differently.

Although not a perfect fit, school districts have many characteristics similar to those measured by Blau. There are levels within district organizations that easily correspond to vertical differentiation. School districts, as they are made up of individual schools, are analogous to the horizontal differentiation found in other organizations. Even though there is differentiation within each school, it is difficult to measure horizontal differentiation as a variable within the school because of its transitory, unofficial nature. But on balance, the official organizational arrangement of each district as given in tables of organization and administrative units offers point of comparison for replication.

The existence and uniformity of job codifications--another measure of differentiation--is fostered by the state, so that both the number and the type of jobs in a district are accessible. The detailed collecting of job titles within schools assures the researcher that the count of administrators, for example, will not include such non-teaching professionals as nurses, librarians, or counselors.

Specialization is not so easily fit into a replication. Role incumbents, Blau argued, should become more expert in their roles as the roles themselves become more specialized in the face of increasing size. Blau measures specialization by educational level and salary. The number of advanced degrees within the district is probably a better measure of specialization than salary because salary in school districts is a function of many factors clearly not related to size.

Automation is a theoretically important intervening variable. Its measure is conceptually similar to that of Blau's, but unlike Blau's operationalization the district measure is a computer use survey of

districts based upon such applications as payroll, grades, budget, personnel, scheduling, accounting, and other specified tasks.

Rationale and Hypotheses

School districts should show an increase in vertical and horizontal differentiation as they increase in size. The span of control of the chief school administrator is somewhat elastic and can expand to coordinate directly a certain number of schools. At some point, the administrator needs another level of administration between central administration and the basic unit. As the district grows, other intervening levels stretch the chain of command from the superintendent to the person at the end of the longest chain from top to bottom. One would not expect the lengthening of the chain to increase in direct proportion to increments in size, however. The problems of coordination and communications engendered by size require additional administrative levels to reduce the span of control; so many administrative levels for so many employees. Therefore, the relationship between vertical differentiation and size should be a curvelinear one.

Horizontal differentiation, in Blau's formulation, is a measure of subunits headed by an administrator. School districts are broken into administrative units. Of these units schools are a stable and thus good measure of horizontal differentiation. Subunits also exist within schools but are not uniform and are generally transient. Therefore, in this replication of the measure of horizontal differentiation as administrative components schools will be used and not subunits. In a manner similar to the hierarchy of vertical differentiation, administrative components in districts increase as increasing size particularizes

the demands placed upon the system. Although larger districts have more schools, the relationship should be curvelinear because each new unit increases the size of the numerator in any ratio of unit to size.

Therefore, a replication should be expected to show:

H1: As the size of school districts increases, the total differentiation increases at a decelerating rate.

As the increasingly larger organization elaborates, the proportion of administrators to total employees is considered on the balance to be dropping; that is, fewer administrators supervise workers in large organizations than in smaller ones. In Blau's estimation, the common wisdom is correct to a degree: the proportion of supervisors tends to increase as size increases, but, paradoxically, that increase in supervisors per employee is mediated by the differentiation. As a result, the ratio of administrators to employees declines and there are proportionally fewer administrators. Therefore, with respect to school districts, one would expect:

H2: As the size of organizations increases, the administrative ratio decreases.

As organizations become differentiated, specialization increases. The role incumbents who occupy places in increasingly differentiated structures become more specialized in their role. At first blush, job title seems a good measure of specialization because it is theoretically associated with size and because it suggests specialization for role incumbents. But job title does not insure the skill of the incumbent. Blau argued that with size clerks performed more of the routine functions of the organization as the professionals in the organization increased their qualifications for complex tasks (Blau and Schoenherr, 1971: 261).

Taking this relationship into consideration as well as the force of differentiation, expressed in schools by job codes, one would expect to find increasingly specialized professionals. One cannot closely follow Blau here because he uses salary as well as educational level to measure specialization. Salary is not a good indicator of job specialization since it can be confounded by such conditions as seniority, local wealth, and teacher militancy. The gaining of an advanced degree, however, should give a positive correlation with size. Therefore:

H3: As the size of school districts increases, the proportion of professionals with advanced degrees will increase.

Methodology

Sample One hundred districts were drawn at random from the pool of districts in a small, urbanized northeastern state. Randomness was attained through a computer generated list of random numbers.

Variables

Size is measured as the total number of full-time employees.

Total Differentiation is the result of adding scores for vertical differentiations and horizontal differentiation. Vertical differentiation is counted as the number of steps in the longest chain from the school superintendent to the lowest employee, as expressed on the district table of organization. Horizontal differentiation was measured as the number of administrative units reported to the state in an annual survey.

Administrative Ratio is the ratio of administrators to total employees. Administrators are those people falling into the administrative code of the state coding manual.

Job Codes give the counts of each job title in the district. The list is from the state's manual of coding in preparation of the annual report to the state on employee characteristics.

Advanced Degrees is the count of degrees following the Bachelors and is reported in the local and state statistics used for payroll and descriptions of employee characteristics.

Automation was measured with a survey instrument in which district business managers described the extent to computer use. Return was 82%.

Analyses Techniques of multiple regression were used in which the variables were loaded into the regression on the basis of theoretical expectations. The independent variable of size was logged in order to follow Blau's analysis and demonstrate curveliniarity on hypothesis 1. Scatterplotting and correlations were used as appropriate.

Findings

Differentiation was considered as both total differentiation and as job codes. When total differentiation was the dependent variable in the regression equation with the log of total employees, the number of total employees, and automation, the log explained nearly .74 of the variance. Total employees and automation added another .10 to the explanation.

Automation contributed very little of the variance when added to the regression. However, when automation was considered against total differentiation as a correlation as part of a Scattergram progress (SPSS), the relationship yielded an R squared of .37, significant at the .001 level.

The log of the number of total employees was the best predictor for the rise in the number of job codes. Adding total employees and automation raised the R square .04.

Discussion

In the case of differentiation and job codification, the basic elements of the theory were borne out. Differentiation increases with size at a decelerating rate as does job codification. In the context of school districts, then, the fundamental part of the theory explains as it should.

The non-significant relationship of administrative ratio to size was unexpected. An important part of the theory is Blau's contention that "contrary to the stereotype of the proliferation of bureaucratic machinery in large organizations, the administrative apparatus is smaller in large than in small organizations." The negative correlations supporting this view have been found in government bureaus, retail businesses, universities, and hospitals (Blau, 1972: 8).

It may be the lack of significant relationship arises from pooling both the elementary districts and the comprehensive districts in the analysis. The comprehensive districts are K-12 districts and, as should be expected, have more employees and a larger enrollment than the elementary districts, which as K-6s or K-8s. However, the

differentiation relationships held when the elementary, secondary only, and comprehensive districts were analyszed.

Further investigation will explore the relationship of Automation to these ratios. While Automation did not explain much of the variance in regression equations, Automation correlated with the log of total employees in the Scatterplot program at .60, ($p = .001$, $N = 40$) and a similarly high r with job code. It is possible that Automation is a suppressed variable in the relationship of administrative ratio to size. Further investigation will analyze that possibility.

The limitations of cross-sectional analysis may offer yet another explanation of the administrative ratio problem. As schools have been declining in size, it is possible that as teachers are released, administrators who normally have seniority over teachers move back into the classroom. A longitudinal test would pick variations within districts over time. Another explanation could lie in the presence of quasi-administrators; teachers who perform some administrative functions but receive no official recognition and consequent coding. Longitudinal analysis would be particularly useful as testing for changes in the administrative ratio as districts grew and then declined.

The lack of significant finding in the ratio of degree-holding to total employees was interesting in light of the finding that the correlation for advanced degrees, not the ratio, just the incidence, with size was .91 ($p = .001$, $N - 100$). Apparently, about the same proportion of teachers get advanced degrees irrespective of size of the district.

Conclusion

Beyer and Trice (1979), though successful in replicating the relationship of size and differentiation, were pessimistic at the prospect of a single variable or set of variables explaining organization characteristics beyond differentiation. They write that further studies will probably produce other relationships than the ones predicted by differentiation theory.

One may agree with Beyer and Trice and yet argue that the differentiation theory should still undergo rigorous testing in the context of school organizations. General studies of size over the past two decades (Kimberly, 1976) have led to useful explanations of the relationship of complexity, specialization, administrative ratio, and other variables in organizations. The theory has served general inquiry into organizations by providing a backdrop against which research has played itself out. The theory has been refined, altered, and may even have been exhausted, but it has yielded a great deal of information about organizations. The theory has not been exhaustively applied to school organizations, and in the interest of placing school data in perpective, it should be utilized.

Table 1

Regression of Total Differentiation on Log of Total Employees, Total Employees, and Automation

----------Variables in the Equation----------

Variable	B	Std Error B	F
LogEmp	4.597	1.338	11.805 *
Total Emp	o.908-02	0.001	42.907 **
Automate	-0.331-12	0.123	n.s
(Constant)			

* P= .05, ** P=.01

Variable	Summary Multiple R	r^2	RSQ Change	Simple R
LogEmp	0.858	0.737	0.737	0.858
Total Emp	0.933	0.871	0.134	0.911
Automate	0.934	0.872	0.0002	0.479
(Constant)				

Table 2

Regression of Job Code on Log of Total Employees, Total Employees, and Automation

----------Variables in the Equation----------

Variable	B	Std Error B	F
LogEmp	40.266	13.174	9.065 *
Total Emp	0.352-01	0.017	n.s.
Automate	1.896	1.462	n.s.
(Constant)			

* P = .05

Variable	Summary Multiple R	r^2	RSQ Change	Simple R
LogEmp	0.716	0.513	0.513	0.716
Total Emp	0.734	0.539	0.026	0.671
Automate	0.741	0.550	0.010	0.508
(Constant)				

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